

Skill Check:

**What is the slope of the 2 points
(2, 1) and (3, -7)**

3-6

Transformations of graphs

Vocabulary:

1.) Family of functions

**group of functions with
similar characteristics**

2.) Parent functions

**Basic function in a family
of functions**

3.) Transformations:

**Changes the size, shape
position, or orientation
of graph.**

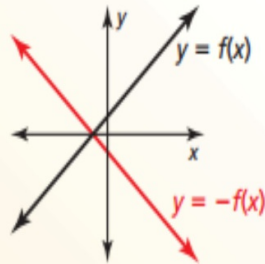
Vocab:

4.) Reflection:

Transformation that flips a graph over a line (line of reflect

Reflections in the x-axis

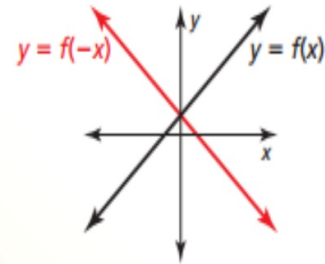
The graph of $y = -f(x)$ is a reflection in the x-axis of the graph of $y = f(x)$.



Multiplying the outputs by -1 changes their signs.

Reflections in the y-axis

The graph of $y = f(-x)$ is a reflection in the y-axis of the graph of $y = f(x)$.



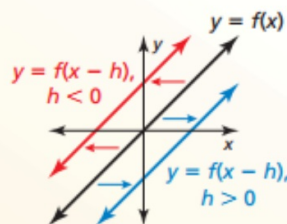
Multiplying the inputs by -1 changes their signs.

5.) Translation:

That shifts a graph horizontally or vertically, but does not change shape or size.

Horizontal Translations

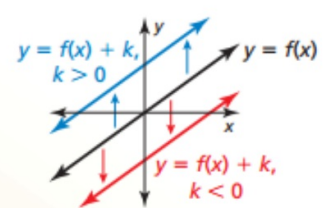
The graph of $y = f(x - h)$ is a horizontal translation of the graph of $y = f(x)$, where $h \neq 0$.



Subtracting h from the inputs before evaluating the function shifts the graph left when $h < 0$ and right when $h > 0$.

Vertical Translations

The graph of $y = f(x) + k$ is a vertical translation of the graph of $y = f(x)$, where $k \neq 0$.



Adding k to the outputs shifts the graph down when $k < 0$ and up when $k > 0$.

6.) Stretch and Shrinks:

Horizontal

1.) Horizontal shrink:

The graph shrinks towards the y-axis

2.) Horizontal Stretch:

The graph stretches away from the y axis

Vertical

1.) Vertical stretch:

The graph stretches away from the x- axis

2.) Vertical Shrink:

The graph shrinks towards the x - axis

**Example 1:
Horizontal &
vertical Translations:**

$$\text{let } f(x) = 2x - 1$$

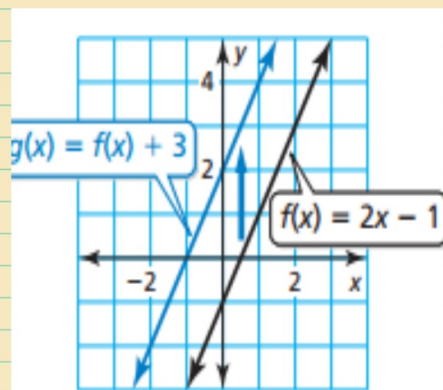
$$\text{Graph } g(x) = f(x) + 3$$

Steps:

1.) Graph the $f(x) = 2x - 1$
Slope = 2 y -int = -1

2.) Put $2x - 1$ in for $f(x)$
 $g(x) = 2x - 1 + 3$
Slope = 2 y-int = 2

3.) Graph and compare both lines



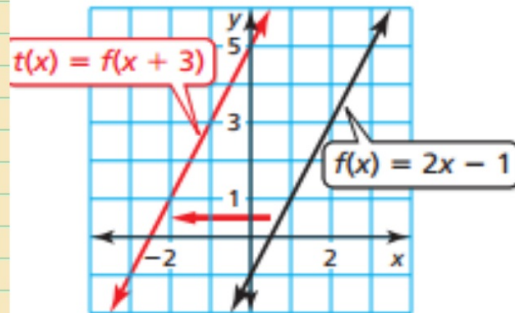
a. The function g is of the form $y = f(x) + k$, where $k = 3$. So, the graph of g is a vertical translation 3 units up of the graph of f .

Practice

$$\text{Let } f(x) = 2x - 1$$

$$t(x) = f(x + 3)$$

The function t is of the form $y = f(x - h)$, where $h = -3$. So, the graph of t is a horizontal translation 3 units left of the graph of f .



Example 2 Reflections on x and y axis

$$\text{Let } f(x) = \frac{1}{2}x + 1$$

$$g(x) = -f(x)$$

Steps:

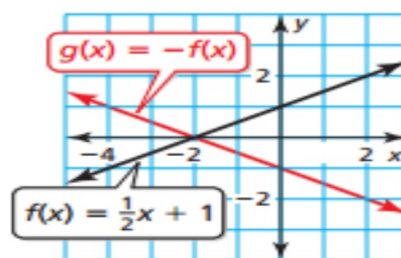
1.) Graph $f(x) = \frac{1}{2}x + 1$

2.) Put $\frac{1}{2}x + 1$ in for $-f(x)$

3.) Graph the new line

4.) Describe the transformation

x	-4	-2	0
$f(x)$	-1	0	1
$-f(x)$	1	0	-1



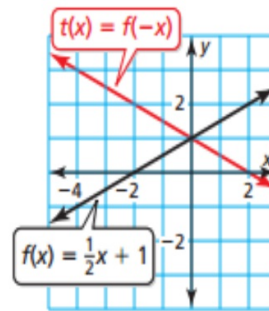
► The graph of g is a reflection in the x -axis of the graph of f .

Practice

let $f(x) = \frac{1}{2}x + 1$

$t(x) = f(-x)$

x	-2	0	2
$-x$	2	0	-2
$f(-x)$	2	1	0



► The graph of t is a reflection in the y -axis of the graph of f .

Example 3: Horizontal & Vertical Stretch

$f(x) = x - 1$
 $g(x) = f\left(\frac{1}{3}x\right)$

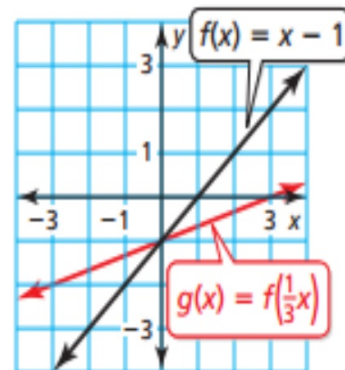
Steps:

1.) Graph $f(x) = x - 1$
Slope = 1 yint = -1

2.) Make a table
use -3, 0, 3

x	-3	0	3
$\frac{1}{3}(x)$	-1	0	1
$f\left(\frac{1}{3}x\right)$	-2	-1	0

3.) Graph and
describe the
transformation of
the lines



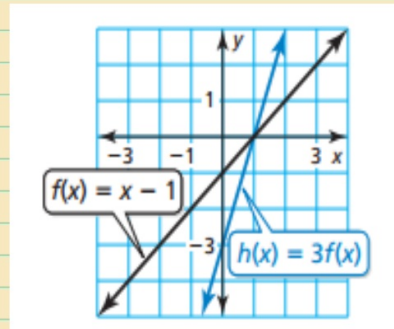
► The graph of g is a horizontal stretch of the graph of f by a factor of $1 \div \frac{1}{3} = 3$.

Practice

Let $f(x) = x - 1$

$h(x) = 3f(x)$

x	0	1	2
$f(x)$	-1	0	1
$3f(x)$	-3	0	3



► The graph of h is a vertical stretch of the graph of f by a factor of 3.

Ex. 4 Shrinks

Let $f(x) = x + 2$
 $g(x) = f(4x)$

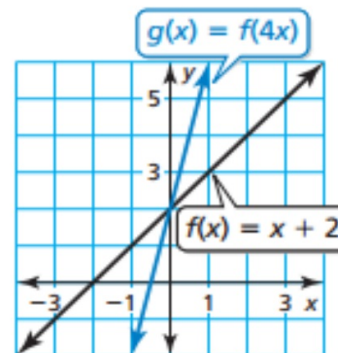
Steps:

1.) Graph $f(x) = x + 2$

2.) Make a table

x	-1	0	1
$4x$	-4	0	4
$f(4x)$	-2	2	6

3.) Graph the line and describe the transformation



► The graph of g is a horizontal shrink of the graph of f by a factor of $\frac{1}{4}$.